

WHAT IS CLAIMED IS:

1. A measuring device for measuring at least one property of contamination of a surface of a component in a lithographic projection apparatus, the measuring device comprising:

a radiation transmitter for transmitting radiation onto at least a part of said surface;

a radiation receiver for receiving radiation from the component in response to the transmitted radiation; and

a processor communicatively connected to the radiation receiver, for deriving at least one property of received radiation and determining at least one property of said contamination from said at least one property of received radiation.

2. A device as claimed in claim 1, further comprising:

a second radiation receiver for receiving at least a part of the transmitted radiation,

wherein the processor is configured to compare said part of the transmitted radiation with the radiation received from the component, determine from the received radiation a relative property relative to said part of the transmitted radiation, and determine from the relative property at least one property of said contamination.

3. A device as claimed in claim 1, wherein the processor is configured to determine at least one property of modulated radiation modulated by the contamination of the surface.

4. A device as claimed in claim 1, wherein the processor is configured to compare at least one property of received radiation with at least one reference value related to the at least one contamination property.

5. A device as claimed in claim 1, wherein the processor is configured to determine a first property of the received radiation, determine a second property of the received radiation, and derive from said first property of the received radiation and the

second property of the received radiation at least one contamination property of said contamination.

6. A device as claimed in claim 5, wherein said processor is configured to derive a first contamination property and a second contamination property from the first and second property of the received radiation.

7. A device as claimed in claim 1, wherein the contamination comprises at least one material which at least partially modulates the transmitted radiation, said at least one material being one of the group consisting of: carbon containing materials, silicon containing materials, oxide containing materials, salt containing materials, and refractory materials.

8. A device as claimed in claim 1, wherein said at least one property of the received radiation comprises at least one of the group consisting of: intensity, wavelength, angle of incidence, polarization, and phase-shift.

9. A device as claimed in claim 1, wherein said at least one contamination property comprises at least one of the group consisting of: thickness, position, roughness, and chemical composition.

10. A device as claimed in claim 1, wherein the receiver is configured to receive radiation reflected by the surface of said component.

11. A device as claimed in claim 1, wherein the receiver is configured to receive radiation transmitted through at least a part of the component.

12. A device as claimed in claim 1, wherein the transmitter is configured to transmit radiation through at least a part of the component.

13. A device as claimed in claim 1, wherein the transmitted radiation or received radiation comprises electro-magnetic radiation.

14. A device as claimed in claim 13, wherein the electro-magnetic radiation comprises at least one of the group consisting of: optical radiation in the range of visible light to far infrared light, ultraviolet radiation, Deep Ultraviolet Radiation, and Extreme Ultraviolet Radiation.

15. A device as claimed in claim 1, further comprising:

a second radiation transmitter for generating radiation at said surface with said transmitted radiation, wherein said generated radiation differs in wavelength or radiation type from said transmitted radiation; and

a second radiation receiver for receiving the generated radiation.

16. A device as claimed in claim 1, wherein the transmitted radiation or received radiation comprises a particle beam.

17. A device as claimed in claim 16, wherein the particle beam comprises an ion beam or an electron beam.

18. A device as claimed in claim 1, wherein comprising a constant intensity radiation transmitter for transmitting radiation with an intensity which is substantially constant in time.

19. A device as claimed in claim 1, wherein the transmitter comprises a variable intensity radiation transmitter for transmitting radiation with an intensity which varies in time.

20. A device as claimed in claim 19, wherein the device is a heterodyne device.

21. A device as claimed in claim 1, wherein the transmitter is part of a radiation system which is used in a lithographic projection apparatus for providing a projection beam of radiation and projecting a radiation pattern with the projection beam of radiation onto a target portion of a layer of radiation-sensitive material.

22. A device as claimed in claim 1, wherein the receiver is configured to receive radiation from at least two different parts of the surface and the processor is configured to determine a property of contamination for each of said different parts.

23. A device as claimed in claim 22, wherein the device is a scanning measuring device with a scanning radiation transmitter for consecutively transmitting radiation on at least two different parts of the surface.

24. A device as claimed in claim 1, wherein the component is part of an optical system of the lithographic projection apparatus.

25. A device as claimed in claim 24, wherein the component comprises one of the group consisting of: a mirror, a lens, a reticle, and a detector.

26. A device as claimed in claim 1, wherein the lithographic projection apparatus is a Deep Ultraviolet or an Extreme Ultraviolet lithographic projection apparatus.

27. A method for measuring at least one property of contamination of a surface of a component in a lithographic projection apparatus, the method comprising:

transmitting radiation on at least a part of the surface;

receiving radiation from the component in response to said transmitting radiation; and
deriving from the received radiation at least one property of said contamination.

28. A method as claimed in claim 27, wherein the method is performed during cleaning of at least a part of said surface.

29. A lithographic projection apparatus comprising:

a radiation system for providing a beam of radiation;

a support structure for supporting a patterning structure, the patterning structure serving to pattern the beam according to a desired pattern;

a substrate support for supporting a substrate;

a projection system for projecting the patterned beam onto a target portion of the substrate, and

a measuring device for measuring at least one property of contamination of a surface of a component in the apparatus, said measuring device comprising a receiver for receiving radiation that has been projected onto the component, and a processor communicatively connected to the receiver, for deriving at least one property of received radiation and determining at least one property of said contamination from said at least one property of received radiation.

30. A device manufacturing method comprising:

projecting a beam of radiation using a radiation system;

patterning the beam with a pattern in its cross-section;

projecting the patterned beam onto a target portion of a layer of radiation-sensitive material; and

measuring at least one property of contamination on at least a part of the radiation system to determine if a surface of said part is contaminated to a certain degree with carbon containing materials, wherein said measuring comprises transmitting radiation on at least a part of the surface; receiving radiation from the component in response to said transmitting radiation; and deriving from the received radiation at least one property of said contamination.

31. A computer program product comprising program code portions for performing a method in a lithographic apparatus, wherein the method comprises transmitting radiation on at least a part of the surface, receiving radiation from the component in response to said transmitting radiation, and deriving from the received radiation at least one property of said contamination.